



RESEARCH NOTE LS-59

LAKE STATES FOREST EXPERIMENT STATION • U. S. DEPARTMENT OF AGRICULTURE

**Effect of Forest Litter on Growth
of Hardwood Seedlings¹**

In the 1930's the Lake States Forest Experiment Station operated a series of large (20 feet long, 10 feet wide, 4 feet deep) lysimeters near La Crosse, Wis. The primary purpose of the experiments was to determine how different kinds of cover affected runoff, percolation, and soil loss in the Lake States' "Driftless Area," a region of flash floods and severe erosion. Detailed descriptions of the installation, treatments, and results were reported recently by Sartz.²

This paper reports on another aspect of the study: how forest litter affected tree growth on the lysimeters.

Stands of young hardwood trees were established by direct seeding on three of the lysimeters in 1934. The soil was a loessal silt loam (Fayette), and the species were red and white oaks (*Quercus rubra* and *Q. alba*) and black walnut (*Juglans nigra*). The seeds were planted just a few inches apart in rows spaced at only 16 inches. This spacing permitted 15 rows of trees per lysimeter. The upper five rows were white oak; the middle five, red oak; and the lower five, black walnut. This

close spacing was used so that the trees would fully occupy the site as soon as possible. Throughout the experiment the trees were thinned whenever they began to crowd each other. The thinnings were chopped up and scattered over their respective plots.

In the spring of 1936 two of the three lysimeters were covered with a 2- to 3-inch layer of native oak leaf litter to simulate local conditions. The litter was replaced as needed to keep the cover uniform throughout the study. The third lysimeter was not mulched, but was allowed to accumulate litter from natural leaf fall.

Stand inventories were taken the fourth, fifth, sixth, and eighth years after seeding. The difference in growth rates between the mulched and unmulched trees — particularly height growth — was striking (table 1). In the fifth year after seeding (third year after the mulch treatment), the mulched black walnut, red oak, and white oak averaged 55 percent, 51 percent, and 40 percent taller, respectively. Differences in the eighth year were 42, 53, and 52 percent. However, the black walnut, which was ill-suited to the soil and site of the lysimeters, practically ceased growing after the fifth year, even on the mulched plot (table 1). Growth differences were also reflected in the thinnings. The mulched plots yielded more than twice as much material (air-dry weight) as the un-

¹ Reported from the Station's field headquarters in La Crosse, Wis., where research is conducted in cooperation with the Wisconsin Conservation Department.

² Sartz, Richard S. Water yield and soil loss from soil-block lysimeters. U. S. Forest Serv., Res. Paper LS-6, 21 pp., illus. 1963. Lake States Forest Expt. Sta., St. Paul, Minn.

TABLE 1. — *Average diameter and height of mulched and unmulched trees*

Species and treatment	Diameter ¹ in inches at age of —				Height in feet at age of —			
	4 yrs.	5 yrs.	6 yrs.	8 yrs.	4 yrs.	5 yrs.	6 yrs.	8 yrs.
Red oak								
Mulched	0.7	0.9	1.0	1.1	4.3	5.3	6.0	6.7
Unmulched	.6	.7	.8	1.0	2.8	3.5	4.2	4.7
White oak								
Mulched	.6	.8	.9	1.0	3.4	4.2	4.7	5.2
Unmulched	.6	.6	.7	.8	2.3	3.0	3.2	3.4
Walnut								
Mulched	.6	.6	.6	.7	2.8	3.1	3.2	3.2
Unmulched	.4	.4	.4	.5	1.8	2.0	2.2	2.1

¹ At ground line.

mulched plots — 18.2 and 8.5 pounds, respectively.

The faster growth probably resulted from

a greater supply of available moisture: the amount of growing season infiltration averaged 3 inches more on the mulched plots.

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